Tanta University **Advanced Communication Systems**
Faculty of Engineering **4th Year (Old Syllabus)**
Dept. of Electronics and Electrical Comm. **Date: 1-6-2013**
Time allowed: 3 hours

Answer the following questions:

Question 1: **(30 Marks)**

a- Define the cognitive radio technique? What is the spectrum sensing's mission?
b- Compare between the decision fusion and data fusion cooperative spectrum sensing.
c- Explain with aided of mathematical expressions the sensing-throughput trade-off.

Question 2: **(40 Marks)**

a- Explain the error control tools, packet structure, and interleaving mechanisms for Bluetooth. Can this interleaving scheme be used for power line communications? Why?
b- What are the main goals of cryptography system? Explain its principals.
c- With aided of sketches, explain RC5 algorithm encryption and decryption.
d- Show how to improve the chaotic Map? And how to measure the encryption quality?

***Question 3*:** **(30 Marks)**

a- Explain the basic idea for power line communications and compare between the different PLC technologies. Sketch the block diagram of the power line communications system model and state the function of each block. Explain the channel characteristics in this system.
b- Sketch the block diagram for OFDM systems and state the function of each block in the diagram.

Question 4: **(Answer two points only)** **(20 Marks)**

a- Deduce an expression for the matched filter impulse response for a signal f(t) that maximizes the output signal-to-noise-ratio.
b- Derive the mathematical model of adaptive linear perdition and sketch its block diagram.
c- Find an expression for the optimum receiver for a baseband binary data transmission system.

Best Wishes

Faculty of Engineering
Tanta University
Electronics and Electrical Comm. Dept.

كلية الهندسة
جامعة طنطا
قسم هندسة الإلكترونيات والإتصالات الكهربية

4th year | **Final Exam** | **Second Term 2012-2013**
[75 Marks] | **Microwave Engineering** | **Code (EEC 4232)**

Time (3 hours), (Exam in two papers)

Answer the following five questions:

Question (1) **[15 Marks]**

(a) **Why** the performance of the conventional tubes is impaired at microwave frequencies.

(b) **Draw** the equivalent circuit of the triode amplifier at low operating frequencies and the microwave frequencies.

(c) At the microwave frequencies **derive** the expression of triode input impedance and **explain** its effect on the triode input ***impedance*** and ***efficiency***.

Question (2) **[15 Marks]**

(a) **Briefly** ***explain*** the following point:
1. The double cavity klystron DCK is a single frequency oscillator.
2. The DCK act as a frequency multiplier.
3. The DCK efficiency is low.

(b) **Only** ***write*** (without derivation) and ***draw*** the relationship between the "buncher departure angle" and the "catcher arrival angle", and ***explain*** the bunching process.

(c) The optimum output power of a double cavity klystron amplifier is 1200 watts. What is the output power of this klystron if the resonator voltage is changed to 75% of its original value keeping other parameters constant.

[Hint: use the Bessel function table in the second papers]

Question (3) **[15 Marks]**

(a) For a reflex klystron oscillator RK, **derive** an expression for the electronic admittance. **Draw** the electronic admittance. **Explain** with drawing how the RK reaches the steady state operation.

(b) A reflex klystron oscillator operates under the following conditions:
$V_0 = 600\,V$, $R_c = 30k\Omega$, $R_L = 30k\Omega$ $f_r = 9GHz$, $L = 1\,mm$. The tube is oscillating at the peak of the lowest order mode. Assume that the transit time τ_g through the gap and the beam loading can be neglected.
1. Find the value of the repeller voltage V_r.

2. Find the direct current I_0 necessary to give microwave output power of 166.66 mW.
3. Determine the electronic and circuit efficiency.

[Hint: use the Bessel function table in this paper, $(e/m = 1.758 \times 10^{11})$]

Question (4) **[15 Marks]**

(a) **Derive** an expression for the circuit equation of the travelling wave tube TWT and **explain** its physical meaning.

(b) A travelling wave tube is operating at $5GHz$. The helix length is $L = 24cm$. An ac input power of $2.51mW$ provides output power of $10\ watts$. The beam voltage is $V_0 = 3\ KV$, the beam current is $I_0 = 30\ mA$, the helix impedance is $Z_0 = 10\ \Omega$. **Find:**

1. The electronic gain in dB.
2. The attenuation in dB.
3. Determine the values of the propagation constants of the three forward propagating waves, and their phase velocities.

Question (5) **[15 Marks]**

(a) **Explain** with the aid of the energy band diagrams the I-V characteristic curve of the tunnel diode.

(b) The resistive cutoff frequency is defined as "*the maximum frequency above which the tunnel diode cannot operate as amplifier*"; **explain?**

(c) A tunnel diode has a junction capacitance $C_j = 2.5\ PF$, and negative resistance of $R_j = -100\Omega$. The diode is placed in a circuit to operate as an amplifier at $f = 1GHz$. The circuit has capacitance $C_c = 1.9\ PF$ and resistance $R_c = 10\ K\Omega$. The source impedance $R_s = 150\Omega$. The circuit provides voltage gain of 30. **Find:**

1. Load resistance.
2. The amplifier bandwidth.

Bessel function table

x	$J_1(x)$
0.814	0.3689
0.916	0.406
1.22	0.499
1.95	0.579
2.83	0.409

With my best wishes

Dr/ Amr Hussein

Tanta University	Department of Electronics and Electrical Communication Engineering	Faculty of Engineering

Course: **Computer Networks**	Course Code: **EEC4231,**	Students: **4th year**
Date: **Mon., 03-June-2013,**	Time Allowed: **3 hours,**	No. of Pages: **2,**

Final Exam

(Total Marks: 75 marks)

Answer the following questions:

Q1: [15 Marks]

a) Interconnecting PCs via a network has advantages. What are the benefits of interconnecting PCs via a network? And what are the classes of networks according to their coverage area and topology? Compare between them.

b) Deduce the benefits of breaking network functions into seven distinct layers?

c) Find the OSI layer that perform the following functions:

1- Data rate	2- Access control	3- Connection control	4- Grouping
5- Line configuration	6- addressing	7- Flow control	8- Compression
9- Encryption	10-Web browser	11-E-Mail	12-Error detection

Q2: [20 Marks]

a) What are the essential network devices required to build a network?

b) Compare the different ARQ algorithms and deduce the OSI layer(s) responsible for it.

c) Describe in details the Ethernet frame structure.

d) A data block of 16 bit is protected CRC algorithm and transmitted over a wireless channel. If the data is "1011000000001110" and pattern, "1101001011" find:

i. The transmitted message

ii. If the message transmitted encountered a burst error in the first five bits (from the LSB side), show how does the receiver detect transmission errors and find if this error is detectable.

iii. What is the line code waveform representation of this message, using the BZ8S and the differential Manchester at the transmitter and the receiver?

Q3: [15 Marks]

With the aid of sketches and flow charts, describe in details the different techniques for accessing the network's transmission media indicating the advantages and disadvantages for each technique. From your answer, deduce the OSI layers that are responsible for that and the suitable network physical topology that suits to each technique?

Q4: [10 Marks]

a) Compare between the different IP address classes indicating the address space, number of hosts in each case, usages, and binary and decimal representation of the addresses.

b) A Large LAN has interconnects 350 PCs. It is required to separate them into 8 smaller sub LANs. If you have the choice of the IP address class, what class should be used? State the procedure for subneting and design these subnets.

Q5: [15 Marks]

a) For a WLAN, what are the meaning of the following?: SSID, BSSID, STA, BSS, and IBSS

b) What are the main parts for a MAC layer frame of an IEEE802.11 WLAN? Draw it, indicating the purpose of each field.

c) The MAC layer of an IEEE802.11 WLAN defines a set of management frames. What are they? And what is the purpose for each one?

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With best wishes of success

Dr. Sameh A. Napoleon

Tanta University | Department: Electronics and Electrical Communication Eng. | Faculty of Engineering

Total Marks: 85 Mark

Course Title: Information Theory	Course Code: EEC4237	Year: 4th
Date: 5/6/2013 (Second Term)	Allowed time: 3 hours	No. of Pages: (2)

Remarks: (answer the following questions, assume any missing data, answers should be supported by sketches, Neat answers and boxed results are appreciated)

Question (1) *(16 degree)*

(a) Define the following codes: Prefix code, non-singular code, unique decodable code, and instantaneous code.

(b) Check the previous characteristics for the following codes.

Code I	Code II	Code III
1	0	0
00	10	01
01	110	011
10	111	111

Question (2) *(20 degree)*

(a) Show that the mutual information of a channel is symmetric.

(b) Prove that $I(X_i;Y_j) = H(X_i) - H(X_i/Y_j)$

(c) A transmission channel has the following matrix;

$$\begin{bmatrix} ..... & 0.08 & 0.13 \\ 0.06 & ..... & 0.09 \\ 0.14 & 0.12 & ..... \\ ..... & 0.04 & 0.06 \end{bmatrix}$$

With source probabilities $[P(x)]=[0.25,....,0.4,\ 0.17]$. Determine:-

(i) The source efficiency and channel efficiency.

(ii) Construct both the joint and transition matrices of the opposite type of channel.

(iii) Calculate the average amount of lost information on receiving a message of 30 symbols.

Question (3) *(25degree)*

(a) Consider a code with the following P matrix;

$$P=\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

(i) Determine the minimum size n of the codeword?

(ii) Which of the following is a codeword; (1001101), (0101100)?
(iii) Find the codeword C for the given message (1010). What is the Hamming weight of the resulted codeword?
(iv) If the fifth bit of the received codeword is 1, check if an error has occurred or not. If so, how does the decoder know the position of the erroneous bit?

(b) Check whether the received signal "0010111010101100" is error-free or not using Hamming code (16, 11), where the Hamming bits are in positions 1, 2, 4, 8, and 16.

(c) Determine the parity check matrix for a (7, 4) code, using P matrix as follow:-

$$P=\begin{bmatrix}1&1&1\\1&1&0\\1&0&1\\0&1&1\end{bmatrix}$$

What is the information message if the received codeword is "1110001".

Question (4) *(24 degree)*

(a) A continuous transmission channel has the following joint probability density function.

$$P(x,y)=\begin{cases}6e^{-2x-3y} & x,y>0\\ 0 & o.w\end{cases}$$

(i) Define the channel type.
(ii) Calculate h(x), h(y) and I(x;y).

(b) A terminal is used to enter alphanumeric data into a computer through a telephone channel of 3400 Hz. It is found that the obtained channel rate is 14929 bit/sec. Determine the following:-

(i) S/N in dB.
(ii) If the channel bandwidth is doubled, what will be the required S/N for the same channel rate?

(c) Construct a convolution encoder with the commutator samples $C_1=D_1$, $C_2=D_1\oplus D_2$, and $C_3=D_1\oplus D_2\oplus D_3$. The data input stream is 1011. Find the message coded by the encoder.

Best Wishes of Success

Tanta University **Advanced Communication Systems**
Faculty of Engineering **4th Year**
Dept. of Electronics and Electrical Comm. **Date: 21 - 5 - 2013**
Time allowed : 3 hours

Answer the following questions:

Question 1: **(Answer two points only)**

a- Compare between the different power line communication technologies.
b- Discuss the channel characteristics in power line communication.
c- What are the regulatory constraints for power line communication?

Question 2**: (Answer two points only)**

a- Discuss the Bluetooth protocols.
b- Illustrate with a schematic diagram the Bluetooth network structure. What are the classes of power used in Bluetooth systems?
c- Explain the interleaving schemes utilized in Bluetooth systems.

Question 3**: (Answer two points only)**

a- Define cryptanalysis and compare between the different attacks on encrypted data.
b- Compare between the modes of operation in image encryption.
c- Explain the idea of homomorphic image encryption and decryption.

Question 4**: (Answer two points only)**

a- Derive the mathematical model of the linear prediction filter.
b- Show mathematically how adaptive linear prediction is performed.
c- Find an expression for the optimum receiver in wireless communication systems.

Question 5**: (Answer two points only)**

a- Compare between the different decision fusion rules in cognitive radio systems.
b- Explain the non-cooperative spectrum sensing scenario in cognitive radio systems.
c- Find expressions for the probability of detection and probability of false alarm in spectrum sensing for cognitive radio.

Question 6: **(Answer two points only)**

a- What is the rule of the cyclic prefix in OFDM systems?
b- Explain the frequency-domain equalization process in OFDM system.
c- Sketch the block diagram of the OFDM system and explain the function of each block.

Best Wishes